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# An Integrated Analysis Framework for Customer Value, Customer Satisfactory, Switching Barriers, Repurchase Intention and Attitudinal Loyalty: Evidences from China Mobile Data Services

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## Abstract
Mobile data services in China are blooming. At the same time, fierce competition of service providers lower the customer loyalty, thus decrease the revenue and efforts of sustainable development. So it's critical to know the antecedents and their effects on customer loyalty. In this study, we empirically explore the interrelationship among customer value, customer satisfactory, switching barriers and customer loyalty in China mobile data services context by Partial Least Square. The results show that all antecedents have different positive effects on customer loyalty. Management implications are discussed.

**Key words:** Mobile data services; Customer value; Customer satisfactory; Switching barriers; Customer loyalty

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## INTRODUCTION
Mobile data services (MDS) are digital services added to mobile phone networks other than voice services in which the contents included can be either self-produced by mobile telecom service providers or provided through strategic alliances with content providers[1]. These services include games, icons, ringtones, messages, web browsing, SMS (short message service) coupons, and electronic transaction. They can bring five values to consumers: time-critical needs and arrangement, spontaneous needs and decisions, entertainment needs, efficiency needs and ambitions, and mobility-related needs[2]. Thus, mobile data services will become new opportunities for telecom service providers.

In the field of mobile service, the china draws much attention by huge user base and market potential. According to report from China Ministry of Industry and Information Technology, the subscribers of china mobile communication grow to 747 million with a penetration rate of 56.3% by December 2009. As the report from Analysis International, a famous telecommunication consulting agency, the market of china MDS is 27.7 billion USD with annual increase of 23.5% in 2009, and the market share will grow up to 63.1 billion USD by 2012[3].

Although new services are being released at all times, whether they can improve customer loyalty after consumers have used them so as to effectively increase revenue and sustainable development will be an important issue for telecom service providers. Customer loyalty has a powerful impact on firms' performance and is considered by many companies an important source of competitive advantage[1][4][5]. The consequences of enhanced customer loyalty in service firms are increased revenue, reduced customer acquisition costs, and lower costs of serving repeat purchasers, leading to greater profitability[6-10]. Customer loyalty has also been shown to be important in the telecommunication and information service environment[1][5][8][10]. Indeed, customer loyalty constitutes an underlying objective for strategic market planning[11].

Potential antecedents of customer loyalty include customer satisfaction, switching costs, and customer

value. Considerable attention has been given to customer satisfaction as a potential determinant of customer loyalty during the past two decades[9][12]. Aside from improving customer satisfaction, increasing switching costs is a common strategy advocated to increase customer loyalty as the costs of switching to alternative suppliers can deter customers from using these suppliers[5][6][13][14]. Customers may also stay loyal to a company if they feel that they are receiving greater value than they would from the competitors[1][14][15]. Although researchers acknowledge the importance of the customer loyalty concept in marketing theory and practice and have made attempts to investigate some of the relationships between customer loyalty, satisfaction, switching costs, and customer value in many industries, the complex interrelationships between these constructs are still not well understood, particularly in the MDS' context[1][6][7][10]. Moreover, only a little research has empirically investigated these constructs in a single framework, and little research in China, the most potential MDS market in the world.

The objectives of this study is to propose and empirically analyze a conceptual framework that considers customer value, customer satisfaction, and switching costs as antecedents of customer loyalty in a MDS context. We incorporate the complex interrelationships of all these constructs into the framework, and test them in China environment. Understanding how various factors relate to customer loyalty can help managers monitor and enhance customer loyalty effectively through initiatives involving those factors that directly affect customer loyalty.

We also compare the strengths of the different relationships in our model. In particular, we examine whether customer loyalty is more strongly affected by customer satisfaction than it is by switching costs. From a managerial perspective, if customer satisfaction exerts a stronger effect, managing customer satisfaction will be more important than influencing switching costs. In addition, we extend the conceptualization of customer loyalty as repurchase intention and attitudinal loyalty intention. Existing studies showed the differential impact of antecedents on different types of behavioral intentions, which can be considered correlates of customer loyalty[6][14]. Consistent with their result, we conceptualize customer loyalty as two constructs: One is intention of repurchase which reflect customer's intention to repeat purchase or patronage, the other is attitudinal intention which means recommending the service provider to other buyers and keeping long relationship with the service provider.

The study is organized as following: Section 2 is background information of mobile communication and MDS market in China, section 3 is literatures review and hypothesizes development, section 4 is research methods, section 5 is empirical results and implication, section 6 is conclusions and limitation of this research.

# 1. THE CHARACTERISTICS OF THE CHINA MOBILE TELECOMMUNICATION SERVICES AND MDS MARKET

## 1.1 The Development of China's Mobile Market

China's mobile services are mostly provided by China Mobile, China Unicom and China telecom corporations. China started its mobile telephone business in November, 1987 with just over 150 mobile subscribers. The development of China's mobile market can be divided into four stages[3][16].

### 1.1.1 Initial Development (1987–1993)

This was characterized by satisfying an urgent customer demand for mobile analog phones. The clumsy handset became a symbol of wealth and social status. Only business people in metro cities and foreign corporations could afford the services. China Telecom is the state owned enterprise allowed to offer local and long distance services.

### 1.1.2 Rapid Development (1994–2000)

The Chinese government decided to actively support the development of the domestic mobile communications industry in 1994, establishing China Unicom Corporation, or LianTong, to provide wireless and value added services. It became the driving force behind the transition from an analog network toward widespread use of digital global systems for mobile communications (GSM) services. In 1995, these services were launched in Beijing, Shanghai, Tianjin and Guangzhou. Service charges also experienced a sharp drop due to competition. In 1999, China Telecom's mobile division was spun off to become China Mobile. With a fully established million mobile users, Internet users reached only 137 million nationwide GSM wireless network, the Chinese mobile market was recognized as the largest in the Asia Pacific area

### 1.1.3 Transition to Data Services (2001–2008)

China Unicom and China Mobile had collectively led the revolution of the mobile communications industry in China. Both companies launched wireless application protocol (WAP) for wireless services and offered a variety of value added data services. By the end of 2003 the number of mobile users in China exceeded the number of fixed line users. Local wireless access services are well received even in small cities and some remote villages. By the end of 2008, the total number of subscribers reached 641 million.

### 1.1.4 Step into 3 Generation (2009-)

In 2009, the licenses of third generation wireless communication (3G) have been issued to China Mobile, China Unicom and China Telecom. Now there are three giants in China mobile communication market. China is actively expanding and upgrading its infrastructure to prepare for high speed mobile data access, video on demand, and other services. By the end of 2010, the total

number of subscribers reached 829 million. China Mobile is the largest operator, which hold about 70% percent market share.

### 1.2 MDS in China

Among all services, short message service (SMS) (the transmission of text and its immediate display on the mobile device) was received enthusiastically by consumers. The short message business has been booming since 2000, when mobile phone users sent over one billion messages. People are showing a growing preference for the short message which has become one of the major channels to extend Lunar New Year's greetings to relatives and friends. Now SMS still is the largest service of China MDS, but its share of total MDS market is going downward.

Multimedia message service (MMS), personal ring tones and WAP services have also grown rapidly. Downloading and sending multimedia messages and ring tones brought huge profits to mobile operators. For example, the color ringtones business brought over 2.6 billion Chinese Yuan (roughly USD330 million) for China Mobile for the first 6 months in 2006 alone.

In addition to SMS and MMS services, mobile operators in China also allow users to browse wireless Internet for shopping, entertainment, sports news and movies, and financial information. Following the 3G network spreading, the mobile internet access was blooming up in 2010. Now, the MDS revenue in China Mobile surpasses 30% of total revenue. MDS is the competition hot spot of all mobile operators in China.

However, fast development of MDS business leads many problems. The most critical issues to the operators are customer complaint increase and downward loyalty. There is thus an urgent need to understand how to determine MDS customer loyalty, so the operators can take right actions.

## 2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### 2.1 Customer Value

Customer value can be defined from the perspectives of money, quality, benefit, and social psychology[1]. In this study, customer value is the evaluation of the benefits of a product or a service by customers based on their advance sacrifices and exposit perceived performance when they use mobile data services. The benefit perspective indicates that value is customers' overall evaluation of the utility of perceived benefits and perceived sacrifices[7].In other words, consumers may cognitively integrate their perceptions of what they get and what they have to give up in order to obtaining goods. However, the sacrifice means more than the money paid for a certain goods. Non-monetary costs, such as transaction cost, search cost, negotiation cost, and time incurred during the purchase, should also be included[14].

### 2.2 Customer Satisfaction

Customer satisfaction can be defined using the transaction specific perspective or cumulative perspective[1]. The transaction specific perspective indicates that customer satisfaction is the evaluation based on the recent purchase experiences[17]. Compared with the transaction specific perspective, the cumulative perspective stresses overall evaluations, indicating that evaluations of customer satisfaction should be based on all the purchase experiences of the customer, disregarding any specific purchase experience[12]. Wang argued that the cumulative perspective is more capable of evaluating the service performance of firms and more effective in predicting consumers' repurchase behaviors[18]. Among the studies of customer satisfaction in the information industry, Lin and Wang revealed that customer satisfaction of mobile commerce is consumer's total response to the purchase experiences in a mobile commerce environment[19]. Therefore, in this study, customer satisfaction is defined as the total consumption perception of consumers when using mobile data services.

In the research of the relationships between value and customer satisfaction, empirical studies of the conventional retailers discovered that value positively influences customer satisfaction in most cases[12]. it has been shown that consumer satisfaction depends on value to some extent[1][9].For example, Rust and Oliver note that value, like quality, is an encounter specific input to satisfaction, which implicates the positively link between value and satisfaction[9]. A similar conclusion was also proposed in the studies of e-commerce[19].In the aspect of the telecom industry, Wang et al. (focusing the telecom industry in China),Tung (SMS service in Singapore), and Turel and Serenko (mobile services in Canada) all revealed that value is positively related to customer satisfaction[18][20][21]. Thus, Hypothesis 1 is proposed as follows:

H1: Customer value positively influences customer satisfaction in mobile data services.

### 2.3 Switching Barriers

Jones et al. define a switching barrier as any factor which makes it difficult or costly for consumers to change providers[22]. In their empirical study they examined three types of switching barriers: strong interpersonal relationships (the strength of the personal bonds that may develop between the employees of a supplier and the customer), high switching costs (the customers perception of the time, money and effort associated with changing supplier) and attractiveness of alternatives, which refers to whether viable alternatives exist in the market. Burnham et al. distinguishes between three types of switching costs[13]. One is transaction costs incurred when the customer changes supplier. The second is learning costs.

 

The third is artificial switching costs and concerns what the firm does to retain customers. Artificial switching costs are entirely at the firm's discretion. Julander etc. distinguish the switching barriers into positive barriers and negative barriers, which have different effects on customer behavior intention.[14]

### 2.4 Customer Loyalty

Loyalty refers to consumers' commitment to repurchase a preferred product or service consistently in the future[9]. Dick and Basu argued that repeat purchasing alone is insufficient to explain antecedents and procedures of loyalty development because it can be constrained by situational factors such as promotions and stock availability of alternatives at the point of purchase[4]. More recently, the emphasis has shifted to attitude-based models in loyalty research, incorporating cognitive, affective, and conative attitude as the basis of customer loyalty[6].

So the most common way of customer manifesting loyalty is being recommending a service provider to other customers and repeatedly patronizing the provider[6][7][14]. They can be defined as two factors: repurchase intention and attitudinal loyalty intention[4]. Boulding et al. used repurchase intention and word of mouth (WoM) to evaluate consumer loyalty intention[17]. Repurchase intention is the process of an individual purchasing goods or services from the same firm, and the reason for repurchase is primarily based on past purchase experiences. WoM is a process in which consumers who have used a certain product or service pass their experiences through word of mouth to consumers planning to purchase the product or service[23], refer to attitudinal loyalty intention. Consumers who have not experienced or fully understood the properties of a certain product or service may usually rely on WoM to acquire information[1]. Therefore, compared with external marketing strategies, WoM is more important and influential to customer's attitude and behavior[10].

Many studies pointed out that the effects of antecedents of customer loyalty on the repurchase intention and attitudinal loyalty are different[6][14]. So in this study, we define repurchase intention and attitudinal loyalty as two distinct constructs. We will analyze the relationship with other constructs simultaneously.

In the discussion of the relationships between value and customer loyalty, many scholars considered customer value has direct effects on repurchase intention and WoM[1],[7]. Cronin et al. discovered in a cross industrial research that value has positive effects on customer loyalty[14]. Wang et al. which focused on the telecom industry in China also supported that value positively influences customer loyalty[18]. Lin and Wang also revealed that value positively influences loyalty in the research of mobile commerce in Taiwan[19]. Thus, Hypothesis 2 and 3 are proposed as follows:

H2: Customer Value positively influences repurchase intention in mobile data services.

H3: Customer Value positively influences attitudinal loyalty in mobile data services.

Many studies of satisfaction have pointed out a positive relationship between customer satisfaction and customer loyalty[1][7][8]. Consumers with a higher level of satisfaction tend to have a stronger intention to repurchase and recommend the purchased product[8]. The extant studies of e-commerce also provided the similar conclusions[19][24]. Among the studies of the telecom industry, Gerpott, Rams, and Schindler examined the telecom industry in Germany[8]. They also concluded that customer satisfaction is positively related to customer loyalty. Moreover, other studies of the mobile services in Canada and China also supported this argument[18][21]. A positive relationship between customer satisfaction and customer loyalty was supported in the study of mobile commerce and mobile value added services in Taiwan and Singapore[1][19][20]. Therefore, the following hypotheses can be proposed.

H4: customer satisfaction positively influences repurchase intentions in mobile data services.

H5: customer satisfaction positively influences attitudinal loyalty in mobile data services.

According to Burnham et al. and Lam, a customer will be motivated to stay in existing relationships to economize on switching costs, such as the transaction-specific investments that he or she has made on the relationships[13][14]. The establishment of a new relationship represents some sort of investment of effort, time, and money, which constitutes a significant barrier to moving to other service providers when the customer is dissatisfied with the services of a provider. Consistent with these arguments, many studies found switching barriers can strengthen the customer loyalty in telecommunication industry[5][10]. Julander & Söderlund argued that positive and negative switching barriers have different effects on repurchase intention and attitudinal loyalty[14]. On the basis of the foregoing arguments and evidence, we advance the following hypothesis:

H6. Switching barriers are associated with repurchase intentions.

H7. Switching barriers are associated with attitudinal loyalty.

The whole research model is showed in figure 1.

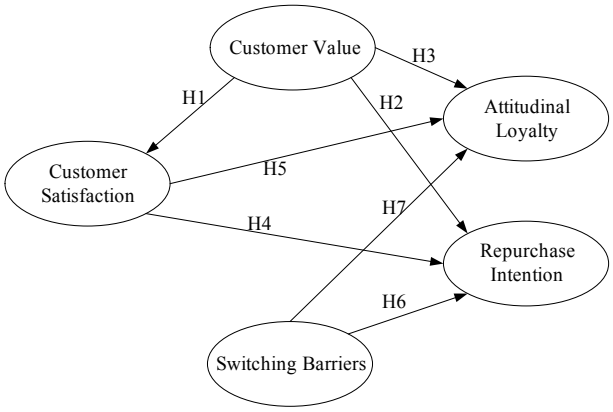


**Figure 1**
**Research Model**

## 3. RESEARCH METHODOLOGY

### 3.1 Measurements

We designed the questionnaire with measures of the relevant constructs primarily based on scales taken from previous research. We made some enhancements, consistent with the specific characteristics of the China and MDS context. To establish the content validity of the constructs, we consulted a number of marketing specialists in the MDS industry before deciding on the measures. The items used in the questionnaire are shown in Table 1.

**Table 1**
**The Items Used in the Questionnaire**

| Construct | Item | Measurement | Reference |
|---|---|---|---|
| Customer value (CV) | CV1 | I feel I am getting good mobile data services for a reasonable price | Kuo(2009)[1] |
| | CV2 | Using the mobile data services provided by this telecom company is worth for me to sacrifice some time and efforts | Kuo(2010)[1] |
| | CV3 | Compared with other telecom companies, it is wise to choose this telecom company | Kuo(2011)[1] |
| Customer satisfaction | CS1 | I am satisfied with the data services provided by this telecom company | Kuo (2009)[1] |
| | CS2 | I think this telecom company has successfully provided mobile data services | Kuo (2009)[1] |
| | CS3 | This mobile data service is better than expected | Kuo (2009)[1] |
| | CS4 | My choice to purchase mobile data service from this provider was a wise one | Cronin et al. (2000)[15] |
| | CS5 | The mobile data service provided by my service provider can address my requirements. | Wang (2004)[18] |
| Switching Barriers | SB1 | Generally speaking, the cost in time, money and effort to switch from my mobile data service provider would be high | Lim (2006)[10] |
| | SB2 | Overall, I would spend a lot and loss a lot if I cancel the mobile data services | Lim (2006)[10] |
| | SB3 | Considering everything, the cost to stop business with my mobile data services provider and start business with new one would be high | Lim (2006)[10] |
| Repurchase Intention | RI1 | In the future, I will use the data services provided by this telecom company again | Kuo (2009)[1] |
| Attitudinal Loyalty | RI2 | In the future, I will continue to use the data services provided by this telecom company | Kuo (2009)[1] |
| | AL1 | In the future, I will recommend the data services provided by this telecom company to my relatives and friends | Cronin et al. (2000)[15] |
| | AL2 | It means a lot to me to continue to use this supplier | Julander (2003)[14] |

### 3.2 Data

According to the Analysis International research, the main customer group is young people with age range from 18 to 30 in China, approximately 70.7% of total survey[3]. The argument has been confirmed by related industrial reports from Taiwan, Japan and South Korea. So we focus young people whose age are from 18 to 30 years old, and used the mobile data service in the past 6 month at least one time. We deliver 350 questionnaires to three colleges in two metro cities in China, with receiving 321 responses. Besides that, we distribute 170 questionnaires to three IT companies which are made up of young employees, with 168 responses. After deleting invalid samples (includes missing items which must be filled in, over the age range or inconsistent answer for the validation questions), we have got 300 valid questionnaires at last, with response rate as 57.7%. The basic statistic information is in table 2.

**Table 2**
**Statistics of Samples**

| Statistic indexes | Value | Percent |
|---|---|---|
| Gender | Male | 54.2% |
| | Female | 45.8% |
| Age range | 18-24 | 67.5% |
| | 25-30 | 32.5% |
| Education level | College degree | 55.1% |
| | Bachelor degree | 36.6% |
| | Master degree or above | 8.3% |
| Main objective | Communication | 60.5% |
| | Entertainment | 25% |
| | Namely information | 13.8% |
| | Transaction | 0.7% |
| Service provider | China Mobile | 79.2% |
| | China Unicom | 18.7% |
| | China Telecom | 2.1% |

### 3.3 Analysis Method

We employ Partial Least Square (PLS) to analyze the data. PLS is a powerful structural equation model (SEM) analysis tool. It can be applied in many research domains, for example, strategies management, management information system, e-business, marketing, etc.. Comparing with other SEM methods, PLS has following advantages[25]:

• PLS delivers latent variable scores

• PLS path modeling avoids small sample size problems and can therefore be applied in some situations when other methods cannot.

• PLS path modeling can estimate very complex models with many latent and manifest variables.

• PLS path modeling has less stringent assumptions about the distribution of variables and error terms.

• PLS can handle both reflective and formative measurement models.

In this study, we leverage smartPLS 2.0 as our PLS analysis tools.

## 4. RESULTS

### 4.1 Total Measurement Model

The reliability of a measure is the extent to which it is free from random error. To estimate the reliability of the instrument, we employed composite reliability (CR) tests and Cronbach's α. As shown in Tables 3, the CR and α of the latent variables are higher than 0.7. So the results indicate that all measures had good reliability[24].

Convergent validity implies that evidence from different sources gathered in different ways all indicated the same or similar meaning of a construct[24]. To test the convergent validity of the measurement model, we calculate average variances extracted (AVE) for each construct. All the AVE are above 0.50, from 0.627 to 0.807, meaning that a good convergent validity could be obtained[24]. The detailed information are in table 3.

Discriminant validity implies that one can empirically differentiate a construct from other constructs that may be similar, and can determine what is unrelated to the construct[24]. To test discriminant validity of the factors, we check if the square root of AVE larger than the correlations between each pair of latent variables. From the table 4, we can find that AVE (Diagonal elements) are larger than the correlation between each pair of latent variables (Off-Diagonal elements). Hence, the discriminant validity is adequate[1].

**Table 3**
**Indexes of Latent Variables**

| latent variables | AVE | Composite Reliability | R Square | Cronbach's Alpha |
|---|---|---|---|---|
| Attitudinal Loyalty | 0.8069 | 0.8932 | 0.385 | 0.7608 |
| Customer Value | 0.7775 | 0.9129 | 0 | 0.857 |
| Repurchase Intention | 0.772 | 0.8712 | 0.3401 | 0.707 |
| Customer Satisfaction | 0.6272 | 0.8936 | 0.6134 | 0.8512 |
| Switching Barriers | 0.6627 | 0.8534 | 0 | 0.7471 |

**Table 4**
**Discrimination Validity Indexes of Latent Variables**

| Latent variables | AL | CV | RI | CS | SB |
|---|---|---|---|---|---|
| Attitudinal Loyalty | 0.898 | | | | |
| Value | 0.547 | 0.882 | | | |
| Repurchase Intention | 0.752 | 0.509 | 0.879 | | |
| Customer Satisfaction | 0.591 | 0.745 | 0.554 | 0.792 | |
| Switching Barriers | 0.439 | 0.494 | 0.425 | 0.578 | 0.814 |

### 4.2 Structural Model

The estimated path coefficients and significance of the structural model are showed in table 5. According to the report, Customer value positively influence customer satisfactory. The path coefficient is 0.608. Hypothesis 1 is supported. Customer value, customer satisfactory and switching barriers can positively influence repurchase intention and attitudinal loyalty. Thus Hypothesis 2 to hypothesis 7 is supported too. In addition, according to R2 results, 61.3% variance of customer satisfaction can be explained by customer value; 39% variance of repurchase intention can be jointly explained by customer value, customer satisfaction and switching barriers. 34% variance of attitudinal loyalty intention can be jointly explained by customer value, customer satisfaction and switching barriers. According to the above results, we can say the proposed model is effective in explaining the relationships among the customer value, customer satisfaction, switching barriers and customer loyalty in MDS.

**Table 5**
**Indexes of Structural Model**

| Hypothesis | Relationship between latent variables | Coefficient | T Value | Significance level | Total Efficient |
|---|---|---|---|---|---|
| H1 | CV->SAC | 0.6079 | 13.839 | *** | 0.6079 |
| H2 | CV->RI | 0.1945 | 2.5578 | * | 0.3952 |
| H3 | CV->AL | 0.2181 | 3.1174 | ** | 0.4352 |
| H4 | SAC->RI | 0.3293 | 3.6682 | *** | 0.3293 |
| H5 | SAC->AL | 0.3552 | 4.2227 | *** | 0.3552 |
| H6 | SB->RI | 0.139 | 1.9987 | * | 0.2309 |
| H7 | SB->AL | 0.1282 | 2.0466 | * | 0.2264 |

* P<0.05;**P<0.01;***P<0.001

Customer satisfactory has the highest direct effects both on repurchase intention and attitudinal loyalty (coefficient is 0.33 and 0.355). The results comply with many studies in telecommunication and information service context[1][8][12][18]. Customer value has highest total effects on repurchase intention and attitudinal loyalty, with 0.395 and 0.435, supporting many studies in telecommunication context[1][14]. It means that the China MDS customers are value oriented. Switching barriers have both positive effects on repurchase intention and attitudinal loyalty. The results are consistent with existing studies[5][14][10]. Furthermore, based on Julander's results, the majority of switching barriers in China MDS are positive switching barriers[14].

## CONCLUSION AND FUTURE RESEARCH

Our findings provide insights into the complex interrelationships between customer value, customer satisfaction, switching barriers, and customer loyalty constructs. In contrast to previous empirical research in which customer value, customer satisfaction, and switching barriers are separately analyzed as antecedents of customer loyalty in the MDS context, this study examines their combined impact on customer loyalty in a single model in the China MDS context.

Our results show that the two dimensions of customer loyalty: repurchase intention and attitudinal loyalty are positively related to customer value, customer satisfaction and switching barriers. Satisfied customers appear to be willing to repeat patronizing the service provider and also to recommend the provider to other customers. Similar to customer satisfaction, customer value and switching barriers, help the service provider retain its customers, consistent with Kuo et al., Kim et al.[1][5] . In addition, higher value or satisfactory seem to encourage customers to recommend the provider to other customers, but switching barriers show more propensity on improve repurchase intention. It implies that improving customer value and satisfactory will increase the affective effect, thus makes the MDS more attractive to customers. However, higher switching barriers mean more cost, thus makes customers to act reasonably.

Our study finds customer value -> customer satisfactory -> customer loyalty chain works. Thus support that customer satisfaction has mediating effects between customer value and customer loyalty. It suggests that for the sake of customer acquisition, it is more important to monitor customer satisfaction scores than customer value scores, since customer satisfaction rather than customer value directly affects the recommend dimension. However, for the concern of customer retention, it is important for management to track customer value scores, because it's the customer value has the highest total effects on customer loyalty, both repurchase intention and attitudinal loyalty intention. The most important antecedents of customer value are service quality and customer perceived sacrifice. So improving service quality, lowing customer sacrifices, e.g., rate of MDS are very essential to customer retention.

Our study has limitations that offer opportunities for future research. Our data are from the China MDS young users. It helps keep unexplained variance ("noise") small in our model estimation and hence increases the power of hypothesis testing. However, it may limit the generalizability of our results. Future research may replicate our study in other age groups and other countries.

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